(12) UK Patent Application (19) GB (11) 2 092 214 A

(21) Application No **8202142**
(22) Date of filing **26 Jan 1982**
(30) Priority data
(31) **3103094**
(32) **30 Jan 1981**
(33) **Fed. Rep. of Germany (DE)**
(43) Application published
11 Aug 1982
(51) **INT CL³**
E06B 7/16 5/16
(52) Domestic classification
E1J GN
(56) Documents cited
GB 1578774
GB 1529733
GB 1529054
(58) Field of search
E1J
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(54) **Fire-resistant sealing strip**

(57) A sealing strip to be fixed to a wing or a main frame e.g. of a fire door by pegs 5, 6 comprises a casing 7 of relatively hard plastics material e.g. hard PVC and a sealing lip 10 of relatively soft plastics material e.g. soft PVC; the casing 7 contains sodium silicate 8 incorporating stabilizing glass filaments 9 which intumesces under fire conditions to inflate or burst the casing and seal the gap between the door and the frame.

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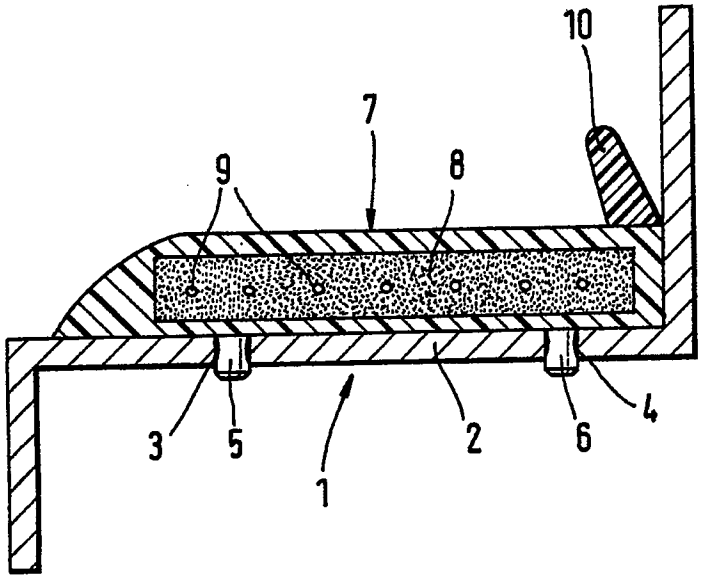
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SPECIFICATION
Sealing strip

This invention concerns a sealing strip, comprising a material which effervesces under the influence of heat and a jacket or casing which encases or encloses the material, which strip can be fixed to the front or edge surface of a door leaf, or to the corresponding confronting surfaces of the frame, of a fire protection door.

In a known sealing strip of this type, the material which effervesces under the influence of heat is enclosed by a flattened tube-like casing which melts easily but is, however, not inflammable. In use, the casing is stuck on the door leaf or on the frame of the fire protection door.

Not only does this known design have the advantage that the effervescent material, enclosed in the described manner, can be used with standard manufactured frames and door leaves, but such material is also reliably protected against mechanical damage and chemical decomposition, yet in the event of fire a comparatively small heat influence suffices to cause the material to expand without hindrance. Aluminium is an example of a suitable material for the flattened, tube-like casing, in known sealing profiles. The hermetic encapsulation of a material which expands under the influence of heat with an aluminium jacket is, however, relatively expensive. Also, in relation to the mechanical demands on the sealing strip, aluminium can be too delicate or sensitive especially when the casing is of thin-walled design. As opposed to this, a relatively thick-walled casing which stands up to the mechanical demands, has the disadvantage that, in the event of fire, the expansion of the effervescent material is hindered and the profile loses its sealing function. With increase in strength or thickness of the walls of the casing, the material can become too isolated from the effect of heat, so that in an extreme case there may be completely insufficient expansion of the sealing profile and sufficient sealing of the gap between the door leaf and the frame cannot be achieved. Then, in the event of fire, smoke and/or toxic gases from the fire can penetrate between the door and the frame and into neighbouring rooms, despite the otherwise-satisfactory functioning of the fire protection door.

The use of a casing which is not absolutely impervious for enclosing a material which effervesces under the influence of heat, such as sodium silicate, can lead to decomposition of the material as a result of penetrating moisture, so that it loses its ability to expand. Because of the casing used for the material, control of the condition of the material is practically impossible, so that with sensitive materials, such as sodium silicate, which are not encapsulated completely watertightly, with absolute certainty, the ability to function in the event of fire cannot be guaranteed.

A further disadvantage of the known sealing strip lies in the fact that in the closed position of the door leaf it must allow a small gap to be present between the door leaf and the frame so that the casing is not rubbed against the door leaf or the frame when the door is opened and closed since this would lead very soon to damage of the casing.

The obtention of a seal between the door leaf and the frame in the event of fire is aimed at, but in most cases the known profiles do not make possible a seal which can be regarded as air-tight.

An object of the invention is to provide a sealing strip comprising a material which effervesces under the influence of heat which on the one hand stands up to the great mechanical demands imposed thereon, and on the other hand offers a guarantee against chemical decomposition of the effervescing material without the material being so shielded from the effect of heat by the casing that its expansion is delayed or is not initiated at all. Over and above this, the sealing strip should be able properly to seal air tightly, in normal cases, the gap necessary between the door leaf and the frame for the operation of the fire protection door.

Starting from the sealing strip referred to in the introduction hereof, it is proposed, for achieving these objects, that the jacket or casing should be formed of a plastics material of relatively small elasticity, preferably hard PVC, and is provided with at least one collar or lip of a plastics material of relatively great elasticity, preferably soft PVC, so shaped and disposed that when the door leaf is in the closed position any gap existing between the edge surface of the door leaf and the frame is sealed by the collar or lip.

In the event of fire, the influence of heat on the strip according to the invention first of all melts the collar or lip of plastics material of relatively great elasticity which hitherto has provided a seal of the gap between the door leaf and the frame, and thus also in normal cases guarantees an air-tight barrier. The heat then acts on the jacket or casing of plastics material of relatively small elasticity, and increases its elasticity as the temperature rises. Meanwhile, the temperature of the effervescent material encased in the jacket or casing also rises, so that in the first stage gases are released, which leads to increase of the pressure inside the jacket or casing, as a result the jacket is blown up.

As a result, the intermediate space in the joint itself is then completely sealed, even if the width of the joint varies or is not constant, since the blown up jacket or casing snugly fits the cross-section of the joint and in this state takes over the sealing function of the collar or lip of plastics material of relatively great elasticity which has meanwhile, been destroyed by the heat. In this way absolute sealing of the joint is guaranteed, in the transition stage from normal to the instance of fire, so that smoke or toxic gases cannot pass through between the door leaf and the frame. Accordingly, so long as the sealing strip is not exposed to the influence of heat, the collar or lip of plastics material of relatively great elasticity

effects the seal; in the event of fire, simultaneously with destruction of the collar or lip, the sealing function is taken over by the jacket or casing which is caused to inflate. With increase in the effect of the heat, the sealing function of the jacket can diminish, since then the effervescent material can effervesce unhindered by the jacket or casing and its volume increases, so that finally the gap between the door leaf and its frame is sealed by the effervesced material alone.

By trials it has been possible to prove that a sealing strip in accordance with the invention guarantees a permanent seal when the effervescent material consists of sodium silicate, the jacket or casing which surrounds the effervescent material is of hard polyvinyl chloride and the collar or lip formed on the jacket or casing is of soft polyvinyl chloride. In a trial fire, a transitionless seal of the gap between the door leaf and its frame resulted; before destruction of the collar or lip of soft polyvinyl chloride, the influence of the heat necessary for achieving such destruction had inflated the jacket or casing by the gases released from the sodium silicate to such an extent that the jacket or casing took over the sealing of the gap before the collar or lip was quite destroyed. Before the jacket or casing melted under the influence of the heat, the sodium silicate finally effervesced so intensively that at this stage the sodium silicate, alone, maintained the seal of the gap.

In accordance with a development of the invention, the cross-section of the strip is designed to be essentially angular in configuration with one side consisting of the effervescent material with the jacket or casing and one side of the collar or lip formed thereon.

Further developments of the invention will be appreciated from the claims appended hereto and from the following description of a preferred embodiment of the sealing profile in accordance with the invention as illustrated in the accompanying drawing, in which the single figure is a sectional end view illustrating the said preferred embodiment as fitted to a door frame.

In the drawing, a frame 1, produced from a Z-shaped angled or bent sheet, possesses, in its web 2 which bounds the gap between the edge surfaces of a door leaf (not shown) boreholes 3 and 4 which are provided in pairs, with clearances between them, along the longitudinal extent of the frame 1.

Pegs 5 and 6 are provided, in an arrangement corresponding to the boreholes 3 and 4, on that side of a jacket or casing 7 which faces towards the web 2 and these pegs 5, 6 can be pressed into the boreholes 3 and 4 of the web 2 for fastening the strip in the manner of press studs.

The jacket 7, which is made of relatively hard polyvinyl chloride, completely seals an effervescent material 8 consisting of sodium silicate. For reasons of stability, glass fibres or filaments 9 are incorporated into the effervescent material 8.

At the right hand side, on the edge of the jacket or cover 7 is a lip or collar 10 formed of soft polyvinyl chloride.

A door leaf (not shown) presses by its edge surfaces against the collar or lip 10 and presses the latter against the opposing limb of the frame 1 in such a way that an air-tight seal is guaranteed in the event of fire, the collar or lip 10 is immediately destroyed, whilst the jacket or casing 7 is inflated and takes over the sealing function of the collar or lip 10 until the material 8 has effervesced sufficiently to fill the gap between the door leaf and the frame 1.

CLAIMS

1. A sealing strip comprising a material which effervesces under the influence of heat and a jacket or casing which encloses or encases the material, which strip can be fixed to the front or edge surfaces of a door leaf, or to the corresponding confronting surfaces of the frame, of a fire protection door, characterised in that the jacket or casing is formed of a plastics material of relatively small elasticity, and is provided with at least one collar or lip of a plastics material of relatively great elasticity, so shaped and disposed that when the door leaf is closed any gap existing between the edge surface of the door leaf and the frame is sealed by the collar or lip.

2. A sealing strip as claimed in claim 1 wherein the jacket or casing is of hard polyvinyl chloride and the collar or lip is of soft polyvinyl chloride.

3. A sealing strip as claimed in claim 1 or 2 chracterised in that the cross-section of the strip is of angular configuration with one side consisting of the effervescent material with its jacket or casing and one side of the collar or lip formed thereupon.

4. A sealing strip as claimed in claim 1, 2 or 3 characterised in that the side of the jacket or casing turned towards the door frame, in the region of the edge which opposes the collar or lip, when the strip is not in the mounted state, has a concave depression such that the edge of the jacket or casing, when the strip is in the mounted state, is pressed against the frame under tension.

5. A sealing strip as claimed in any preceding claim characterised in that pegs are provided on the jacket or casing on the side turned towards the frame, which pegs can be pressed into boreholes in the frame like press-studs.

6. A sealing strip, for a fire-protection door, substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.